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Southeastern Area, State and Private Forestry, 1720 Peachtree Road, N.W., Atlanta, Ga. 30367

Southern Pine Beetle Fact Sheet
Number 23

DAMBUGS—A CASE STUDY[1]

DAMBUGS is a simulation model that uses information on stand characteristics to project southern pine beetle (SPB) damage to timber over a large (multicounty) geographical area. The model applies to loblolly plantations and loblolly and shortleaf stands.

Yearly regionwide physical damages are estimated by simulating the number of SPB spots in individual stands, along with spot growth, then combining these two projections to provide a regionwide estimate.

The model analyzes the following characteristics relating to SPB activity:

Spot incidence.—The model estimates the probability of SPB occurrence in an individual stand. The probability of a spot occurring is a function of basal area, stand age, and site index. The incidence equations vary according to timber type.

Number of spots.—The number of spots expected to occur is simulated by generating a random number (R), from 0 to 1, for each stand and comparing this to the probability (P) generated for each stand by the spot incidence equation. If $R \leq P$, the stand is presumed to contain one SPB spot.

Time of occurrence.—The date of occurrence of a spot is simulated by the use of an empirical time distribution (based on actual historical information) or a uniform distribution. The user selects the distribution.

Spot size.—The number of trees per spot at the time of detection is generated by a frequency distribution approximating an actual spot size distribution that was obtained from historical data for 161 infestations in north central Georgia.

Spot inactivity.—After the date of spot occurrence is generated, the spot is tested to determine if it will become inactive within the next 30 days. The probability of a spot becoming inactive within 30 days is a function of the number of affected trees at the beginning of the 30-day period. The resulting probability is used to determine the eventual size of the spot.

Spot spread.—Spot growth, in terms of the number of trees killed per day, is simulated by comparing a randomly generated number (R), from 0 to 1, to the probability of the spot going inactive (P). If $R \leq P$, the spot is grown for an additional 15 days and terminated. If $R > P$, the spot is grown for an additional 30 days and the new number of infested trees is calculated. The process repeats itself, and the spot is grown at 30-day intervals until it becomes inactive or the end of the simulation period is reached. The number of trees killed per day is a function of basal area, d.b.h., the initial number of attacked trees, and the number of spots per thousand acres.

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[1] The DAMBUGS model was developed as a case study for the North Central Forest Survey Unit of Georgia. Currently, it applies only to that area. It cannot be applied to other areas without altering the computer program and re-estimating the coefficients for some of the equations.

Inputs

(1) Total acres of each host type in the region (multicounty) area.
(2) Average size for each loblolly plantation and loblolly or shortleaf stand.
(3) Site index class.
(4) Total basal area.
(5) Stand age.
(6) Mean d.b.h. (calculated internally by the program).
(7) Initial number of attacked trees (generated by the "spot size" component of the model).

Outputs

(1) Number of acres attacked.
(2) Number of trees killed.
(3) Volume loss. (The user has the option of selecting either a stand level method or a mean tree method for calculating volume.)

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